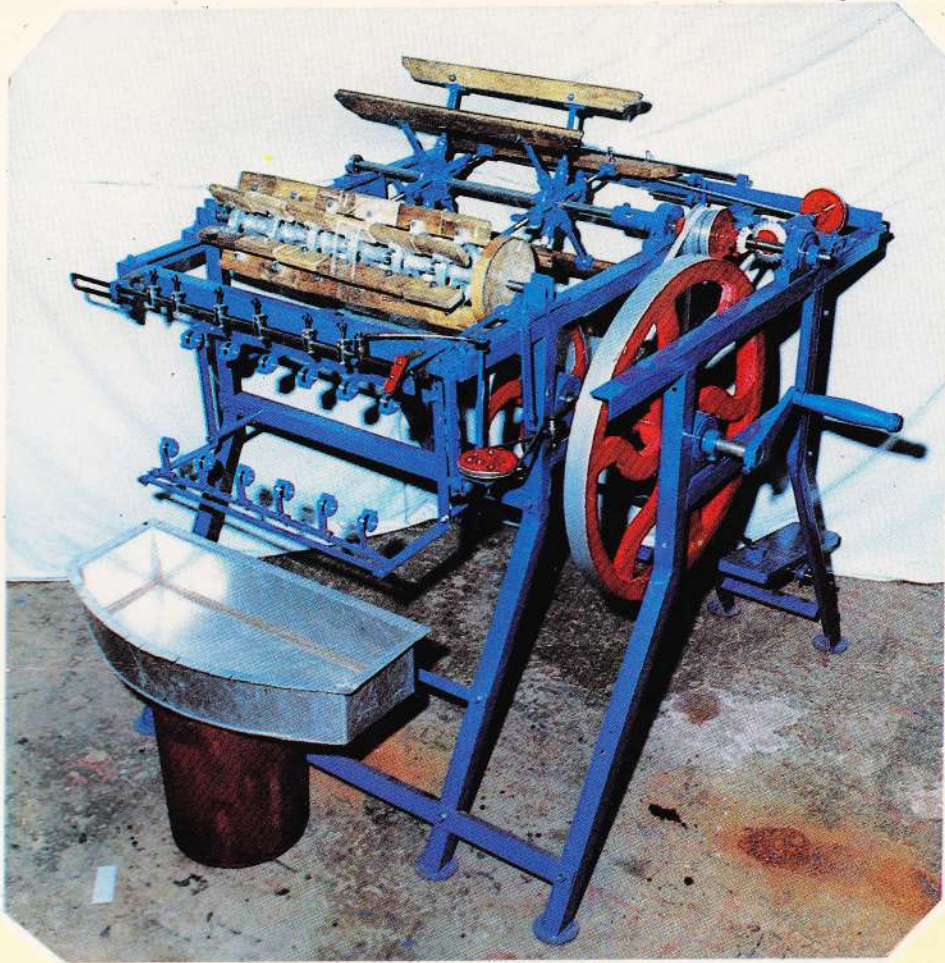


# VIJAY

## IMPROVED REELING MACHINE

A BREAKTHROUGH IN  
SILK REELING INDUSTRY



CENTRAL SERICULTURAL RESEARCH & TRAINING INSTITUTE

MYSORE - 570 008 INDIA

# V I J A Y

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### A BREAKTHROUGH IN SILK REELING INDUSTRY

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## CONTENTS

	PAGE NO.
I. INTRODUCTION	3
II. OBJECTS	5
III. SALIENT FEATURES	5
IV. A BRIEF DESCRIPTION OF VIJAY	5
V. COMPARATIVE REELING PERFORMANCES AND TECHNOLOGICAL CHARACTERS OF RAW SILK REELED ON COUNTRY CHARKHA AND VIJAY	7
VI. MULTIPLE UNITS OF VIJAY -	
a) DOUBLE UNIT MODEL	9
b) FOUR UNIT MODEL	9
VII. MAJOR ADVANTAGES OF VIJAY	9
VIII. PHYSICAL DATA OF DIFFERENT MODELS OF VIJAY	11
IX. COST ESTIMATE FOR ESTABLISHMENT OF DIFFERENT MODELS OF VIJAY	11
X. ABSTRACT OF EXPENDITURE FOR ESTABLISHMENT OF DIFFERENT MODELS OF VIJAY	15
XI. VIJAY - GUIDELINES FOR USERS	16
XII. APPROVED MANUFACTURERS OF VIJAY	18

## ILLUSTRATIONS

I. VIJAY - (SINGLE UNIT) - ISOMETRIC VIEW	4
II. TRADITIONAL CHARKHA	6
III. VIJAY - SINGLE UNIT MODEL	6
IV. VIJAY - DOUBLE UNIT MODEL	8
V. VIJAY - FOUR UNIT MODEL	8
VI. VIJAY - STANDING MODEL	10
VII. MASS PRODUCTION OF VIJAY	10
VIII. ECONOMIC OVEN FOR CHARKHA REELING	12
IX. ECONOMIC OVEN FOR VIJAY - MULTIPLE UNIT MODELS	12
X. LINE DIAGRAM OF FIREWOOD AND HUSK OVENS FOR CHARKHA REELING	14
XI. LINE DIAGRAM OF FIREWOOD OVEN FOR VIJAY - DOUBLE UNIT MODEL	14
XII. RAW SILK PRODUCED ON VIJAY (I.R.D. SILK)	16
XIII. MACHINE DRAWING OF VIJAY	17

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COVER: VIJAY - The CSRTI Improved Reeling Machine

## INTRODUCTION

Silk is the 'QUEEN OF TEXTILES'. Despite the popularity of synthetic fabrics in recent years, silk continues to hold a unique place in the textile world, by virtue of its aesthetic appeal, lustre, feel, suppleness combined with softness, resilience etc.

Raw silk is formed by combining the required number of silk filaments drawn from individual cocoons. The raw silk quality varies according to the cocoon characters, reelers' skill as well as reeling appliances.

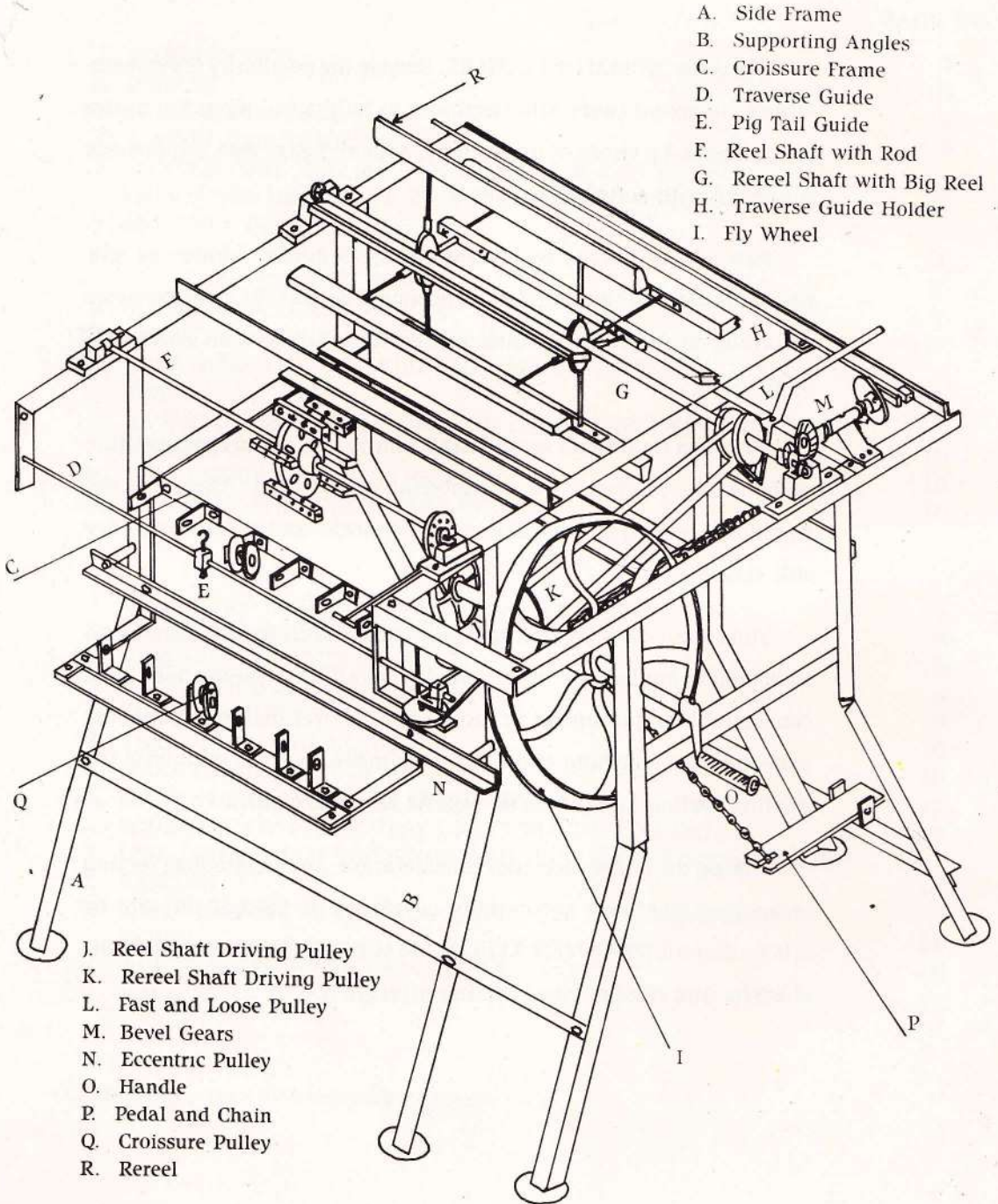
India is a traditional sericultural country and mainly multivoltine cocoons are produced for commercial exploitation. Therefore the traditional reeling systems like country charkha and cottage basin are still existing.

More than 50% of total raw silk produced in India is reeled on traditional appliances like country charkha. There has been considerable improvement in cocoon quality over the years but at the same time no matching effort has been made so far to improvise the existing reeling appliances as well as raw silk quality.

Taking the above facts into consideration, an intermediate reeling technology has been successfully developed at CSR&TI, Mysore by fabricating an IMPROVED REELING MACHINE considering both the charkha and filature-basin reeling principles.



**VIJAY -Single Unit  
ISOMETRIC VIEW**



- A. Side Frame
- B. Supporting Angles
- C. Croissure Frame
- D. Traverse Guide
- E. Pig Tail Guide
- F. Reel Shaft with Rod
- G. Rereel Shaft with Big Reel
- H. Traverse Guide Holder
- I. Fly Wheel

- J. Reel Shaft Driving Pulley
- K. Rereel Shaft Driving Pulley
- L. Fast and Loose Pulley
- M. Bevel Gears
- N. Eccentric Pulley
- O. Handle
- P. Pedal and Chain
- Q. Croissure Pulley
- R. Rereel

## **VIJAY — Improved Reeling Machine**

### **OBJECTIVES:**

1. Improvement in raw silk quality.
2. Improvement in working conditions of charkha reelers.
3. Suitability of the machine for reeling both inferior and superior quality cocoons.
4. Economy in cost of machine and production of raw silk.
5. Easy availability of the machine and its spares.
6. Higher earnings for the reelers per unit quantity of raw silk produced.

### **SALIENT FEATURES:**

1. The improved reeling machine consists of cast-iron or fabricated iron frame with suitable mechanical provisions for carrying out reeling and rereeling operations simultaneously.
2. The machine can be operated manually by pedalling/handling or by power.
3. Tavelletta type of croissure with improved croissure pulleys are introduced to improve cohesion and cleanness properties of raw silk.
4. Individual breaks for both small reel (reeling) and big reel (re-reeling) are provided to operate simultaneously or individually.
5. Porcelain buttons as well as tarapatti are provided for reeling superior and inferior quality cocoons.
6. During rereeling, charcoal drying arrangements are envisaged.
7. As per the requirement, the number of units can be coupled together by a common shaft and can be operated manually or by an electric motor.
8. Economy on floor space and fuel consumption.

### **A BRIEF DESCRIPTION OF THE MACHINE:**

The improved reeling machine consists of two side frames of fabricated iron which are bolted together by two supporting rods, one at the bottom and the other at the top. The backside of the frame is connected with M.S. angle which holds the thread guide for rereeling, pig-tail guide holding rod as well as the aluminium friction rod. The machine can be operated either by rotating a handle or by pedal driving arrangement which is connected to the main driving shaft.

In order to transfer the necessary drive to the reel shaft and rereeling shaft two pulleys of size 30 cm & 15 cm dia are fixed on the main shaft. The smaller pulley (15 cm dia) is grooved on its surface and connected directly with a leather belt to rereel-driving shaft pulley (9.9 cm dia). A small wooden pulley (12 cm dia) is fixed on the rectangular shaft and rests on the reel driving shaft pulley (30 cm dia). The wooden reels on the reel shaft get drive by frictional contact with reel driving shaft pulley.

In front of the machine the reel shaft rests on two ball bearing housings. On the backside of the machine the rereeling shaft rests on both sides of the main frames on ball bearing housings.



## TRADITIONAL CHARKHA



Approximately 60% of raw silk produced in India is reeled on Traditional Charkha. Inferior quality cocoons are generally reeled on this appliance. The entire raw silk produced on country charkha is consumed in handloom industry and generally used as weft.

## VIJAY (SINGLE UNIT)



The Improved Reeling Machine developed at CSR & TI, Mysore. It consists of six reeling ends, improved croissure system and rereeling device. It can successfully replace the traditional charkha with the prime object to improve the quality of raw silk reeled. The quality of raw silk produced on VIJAY is at par with that of basin silk.

The traverse for distribution of threads during rereeling is done by bevel gear arrangement whereas for reeling the same is carried out by pulley driving arrangement. Pig-tail guide holders get to and fro motion from eccentric pulleys with the help of lever and pin connections for reeling and rereeling. At the end of the main driving shaft one large fly wheel (60 cm dia weighing 30 kg) rotates with the main driving shaft by inertia. For reel and rereel shafts, hand brake is provided to engage/disengage the frictional driving pulley.

## COMPARATIVE REELING PERFORMANCE:

### I. COCOON CHARACTERISTICS:

1. Race	Multi × Bi
2. Average Single cocoon weight (gms.)	1.3816
3. Average Single shell weight (gms.)	0.2396
4. Shell ratio %	17.34
5. Average filament length (mts.)	674.25
6. Average non-breakable filament length (mts.)	594.92
7. Average filament size (denier)	2.33
8. Defective cocoon % (on number)	13.26

### II. REELING PERFORMANCES:

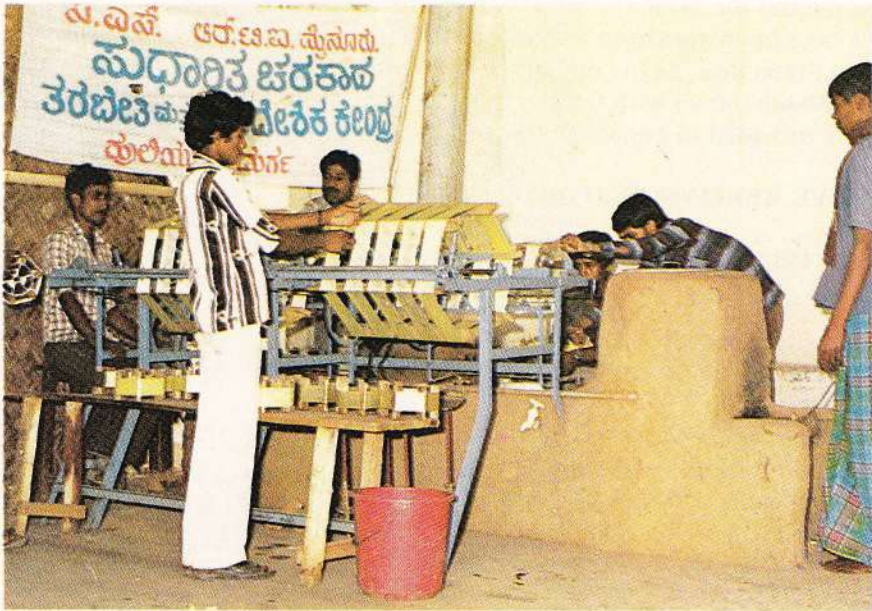
1. Type of reeling machine	Traditional Charkha	CSR&TI Improved Reeling Machine
2. Cooking degree	2.99	3.00
3. Grouping percentage	93.33	93.00
4. Renditta-A	10.10	10.46
-B	8.77	9.09
5. Raw silk %	9.90	9.55
6. Waste %	30.00	31.50
7. Raw silk recovery %	65.78	63.45
8. Reelability %	71.41	70.96
9. Production per machine/8 hrs. (Kg.)	1.50	1.00

### III. TECHNOLOGICAL PROPERTIES:

1. Winding Breaks/40 skeins/hour	90.00	44.00
2. Average size (Denier)	28.89	24.81
3. Average size deviation (Denier)	3.98	1.87
4. Maximum size deviation (Denier)	6.55	2.27
5. Average evenness %	76.25	81.66
6. Average neatness %	75.83	76.66
7. Average cleanness %	81.63	91.77
8. Tenacity (g/d)	3.13	3.16
9. Elongation %	16.33	18.00
10. Cohesion (strokes)	12.00	37.00

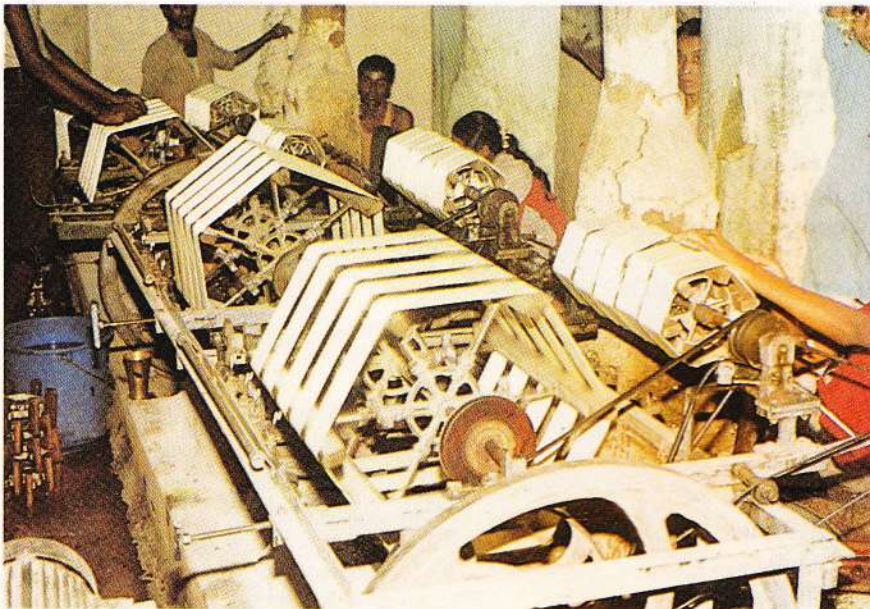


### VIJAY (DOUBLE UNIT)



A Demonstration-cum-Training Centre of VIJAY. New entrepreneurs took the advantage of such training centres to establish 'Self Employed' reeling units.

### VIJAY (FOUR UNIT MODEL)



A VIJAY four unit model operated by electric motor in an entrepreneur's house. This unit is very popular among the reelers.



From the table it can be seen that all technological properties of raw silk obtained from 'Vijay' show a remarkable improvement over that from country charkha. Although the renditta is slightly higher in case of 'Vijay' but the superior quality of raw silk reeled on it will fetch higher returns in comparison with that of country charkha.

Department of Sericulture, Government of Karnataka has taken action to recognise the silk reeled on 'Vijay' by marking on the pass book of the reelers as 'IRD Silk' (Improved Reeling Device Silk). This will help in easy identification of raw silk reeled on 'Vijay' from the one reeled on other reeling appliances. In addition, Government of Karnataka has provided the facility of selling the raw silk produced on 'Vijay' in 'filature' section of Silk Exchange due to its superior quality.

In general 'Vijay' not only upgrades the raw silk quality but also improves economic conditions of the reelers.

#### **MULTIPLE UNITS OF IMPROVED REELING MACHINE:**

In addition to single unit improved reeling machine, multiple unit models are also designed and manufactured with the main intension to bring down the cost of production of raw silk, economy in floor space and higher output.

#### **DOUBLE UNIT MODEL:**

In double unit model two improved reeling machines are combined by a single shaft. This is advantageous in saving floor area as well as in elimination of one of the flywheels. This can be easily operated manually as in single unit. One oven is sufficient to operate a double unit model which helps in saving the fuel consumption. This model can also be operated by an electric motor.

#### **FOUR UNIT MODEL:**

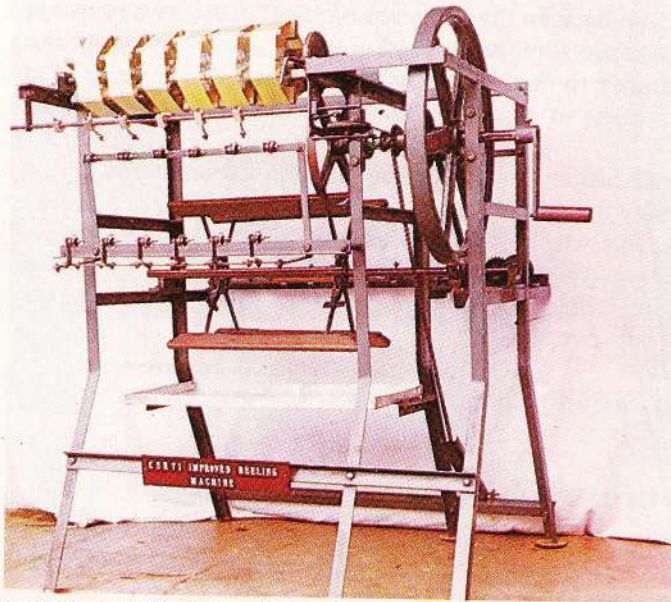
In four unit model four improved reeling machines are coupled by a single shaft driven by electric power which eliminate the use of fly wheels and considerably save the floor space. Fuel efficiency is at par with double unit model. This is more economical than the single unit or double unit and is more popular among reelers.

#### **MAJOR ADVANTAGES OF 'VIJAY'**

1. The raw silk reeled on 'Vijay' is sold at a higher price by Rs. 50/- to Rs. 150/- per kilogram over Charkha Silk due to its superior quality.
2. Different models of 'Vijay' can be operated using C.S.R.&T.I. (Mysore) economic oven which ensures more hygenic conditions than country charkha.
3. Multiple models of 'Vijay' help in saving labour, fuel and floor space which inturn brings down the cost of production per unit quantity of raw silk produced.
4. The higher investment on the establishment of 'Vijay' can be realised within a few months by means of additional profit gained.



## VIJAY - THE STANDING MODEL



This model is specially designed to enable the reelers for reeling either in standing posture or sitting on a stool instead of squatting position. This provides more comfortability to the reeler at work and adds to the quality of silk reeled.

## MASS PRODUCTION OF VIJAY



Large scale manufacturing of VIJAY is being undertaken by a number of approved manufacturers in different parts of the country. The photograph shows a set of single unit VIJAY ready for despatch at one of the workshops.

## PHYSICAL DATA FOR DIFFERENT MODELS OF VIJAY

Sl. No.	Particulars of improved reeling machine	Single unit	Double unit	Four unit
1.	Number of cooking-cum-reeling basins	One	Two	Four
2.	Type of croissure	Tavelletta	Tavelletta	Tavelletta
3.	Number of ends	6	12	24
4.	Driving arrangements	Pedal/handle	Handle/power	Power
5.	Number of operators required:			
	1. Reeler	1	2 2	4
	2. Turner/rereeler	1	1+1 1	1
	Total:	2	4 3	5
6.	Number of ovens required	One	One	One
7.	Quantity of cocoons (Multi×Bi) consumed for 8 hours (kg.) (approx.)	10.0	20.0	40.0
8.	Quantity of raw silk obtained for 8 hours (kg.) (approx.)	1.0	2.0	4.0

## COST ESTIMATE FOR ESTABLISHMENT OF DIFFERENT MODELS OF VIJAY

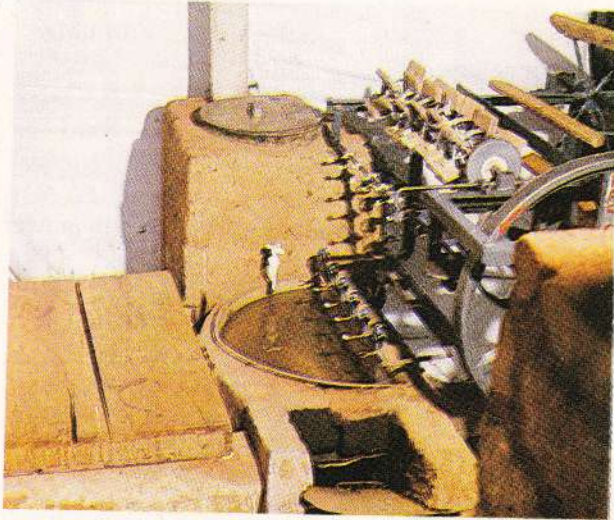
Production particulars	Single unit (manual)	Double unit (manual)	Four unit (power)
1. Number of basins	One	Two	Four
2. Quantity of cocoons consumed/day. (kg.)	9.000	18.000	36.000
3. Average production of raw silk/day. (kg.)	0.950	1.900	3.800
4. Average renditta	9.500	9.500	9.500
5. Quantity of cocoons consumed/month (kg.) (for 30 days)	270.000	540.000	1080.000
6. Quantity of raw silk produced (kg.)	28.500	57.000	114.000
7. Quantity of silk waste produced/month (@ 30% on raw silk produced) (kg.)	8.550	17.100	34.200
8. Quantity of pupae obtained/month (@ 25% on raw cocoon weight) (kg.)	67.500	135.000	270.000

### INVESTMENT PARTICULARS:

1. Construction of reeling shed with rat-proof plinth, Rs. 120/sq.ft.			
a) Floor area required (sq. ft.)	60	120	240
	(6'×10')	(12'×10')	(24'×10')
b) Construction cost (Rs).	7200.00	14400.00	28800.00



## **ECONOMIC OVEN FOR CHARKHA REELING**



The economic oven designed by CSR & TI Mysore for charkha reeling ensures maximum utilisation of heat energy per unit quantity of fuel, improved working conditions for reelers and considerable savings on fuel cost. This can be suitably modified for the use of husks, firewood, coal or dry mulberry cuttings. Photograph shows an economic oven attached with a single unit VIJAY.

## **ECONOMIC OVEN FOR VIJAY - MULTIPLE UNIT MODELS**



The economic oven of VIJAY double unit model has the facility for continuous supply of hot water from the reserve drum to the reeling basin along with the provision for draining out the dirty water from reeling basin. This arrangement improves the lusture of the silk yarn produced in addition to savings on fuel cost. This also maintains the hygienic working conditions for the reelers.

2. Cost of machinery and equipments:			
a) Cost of reeling machine (Rs.) (including paking & forwarding)	4,000.00	8,000.00	18,000.00
b) Installation charges (Rs.)	400.00	800.00	1,000.00
c) Cocoon storage racks (Rs.) (16 trays per rack)	800.00 (one No.)	1,600.00 (2 Nos.)	3,200.00 (4 Nos.)
d) Miscellaneous charges (Rs.) (skeining machine, cooking laddle, etc.)	750.00	750.00	750.00
Total:	13,150.00	25,550.00	51,750.00
3. Operational cost per day (Rs.)			
a) Wages:			
i. Rs. 15./day/reeler	15.00	30.00	60.00
ii. Rereeler-cum-turner/day	10.00	15.00	—
iii. Rereeler per day	—	—	15.00
iv. Helper	10.00 (one)	15.00 (one)	20.00 (two)
b) Fuel cost:			
i. Rs. 15./unit/day	15.00	30.00	60.00
ii. Electricity charges (Rs.)	—	—	7.00
Total:	50.00	90.00	162.00

### WORKING CAPITAL FOR ONE MONTH:

(30 WORKING DAYS)

a) Raw material cost @ Rs. 80/- per kg of green cocoons (Rs.)	21,600.00	43,200.00	86,400.00
b) Operational cost (Rs)	1,500.00	2,700.00	4,860.00
c) Contingent expences (Rs):			
i. Cost of stifling @ 0.25 per kg.	67.50	135.00	270.00
ii. Transportation charges Rs. 15/- per day (cocoon, fuel, etc.)	450.00	900.00	1,800.00
iii. Miscellaneous charges (Rs.)	100.00	100.00	100.00
Total:	23,717.50	47,035.00	93,430.00

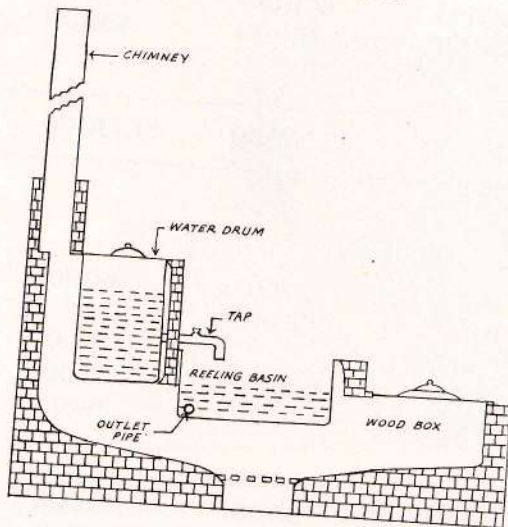
COST OF PRODUCTION OF ONE KG OF  
RAW SILK (RS)

832.19                      825.17                      819.56

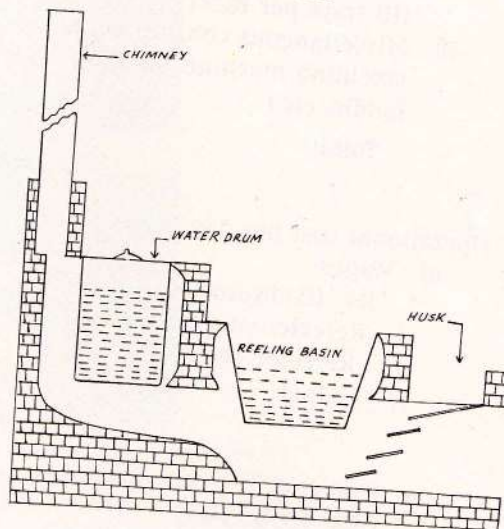


# ECONOMIC OVEN FOR CHARKHA REELING

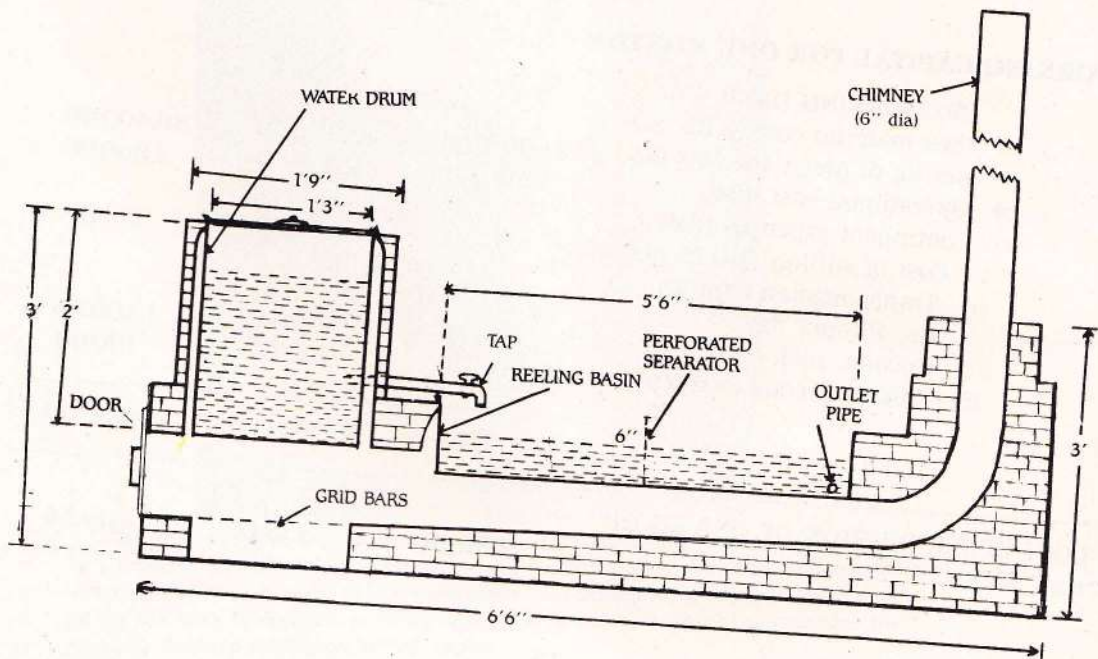
FUEL EFFICIENT FIRE WOOD OVEN



FUEL EFFICIENT HUSK OVEN



**ECONOMIC OVEN FOR VIJAY DOUBLE UNIT MODEL - (FIREWOOD TYPE)**



**EXPENDITURE AND COST BENIFITS OF ESTABLISHMENT OF THE SILK REELING  
UNIT WITH DIFFERENT MODELS OF VIJAY (ABSTRACT)**

Particulars	Single unit (Manual)	Double unit (Manual)	Four unit (Power)
1. Cost of reeling shed (Rs.)	7,200.00	14,400.00	28,800.00
2. Cost of reeling machine (Rs.)	5,950.00	11,150.00	22,950.00
3. Cost of accessories (Rs.)	1,000.00	1,500.00	2,000.00
4. Working capital:			
A: One month	23,717.00	47,035.00	93,430.00
B: Three months:	71,151.00	1,41,105.00	2,80,290.00

**GROSS INCOME PER MONTH:**

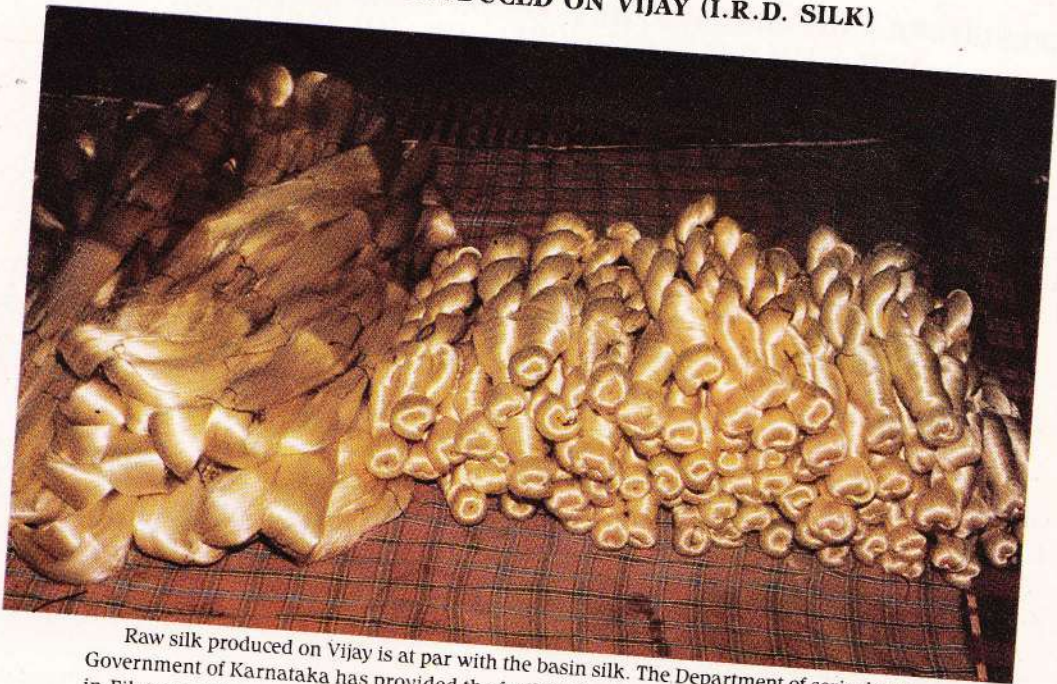
1. Revenue from raw silk @ Rs. 870/Kg.	24,795.00	49,590.00	99,180.00
2. Revenue from silk waste @ Rs. 50/Kg.	427.50	855.00	1,710.00
3. Revenue from pupae @ Rs. 0.50/Kg	33.75	67.50	135.00
<b>Total: Rs.</b>	<b>25,256.25</b>	<b>50,512.50</b>	<b>1,01,025.00</b>

**EXPENDITURE PER MONTH:**

1. Working Capital (Rs.)	23,717.00	47,035.00	93,430.00
2. Depreciation of reeling shed, machinery and equipments @ 12.5% per annum (Rs.)	136.98	266.74	539.06
3. Interest on total investment @ *12.5% per annum (Rs.)	384.04	756.09	1,512.29
<b>Total: Rs.</b>	<b>24,238.52</b>	<b>48,057.23</b>	<b>95,481.35</b>
<b>Net income per month</b>	<b>1,017.73</b>	<b>2,455.27</b>	<b>5,543.65</b>
<b>Income per day</b>	<b>33.92</b>	<b>81.84</b>	<b>184.78</b>
<b>Income per kg of raw silk</b>	<b>35.70</b>	<b>43.07</b>	<b>48.62</b>



## RAW SILK PRODUCED ON VIJAY (I.R.D. SILK)



Raw silk produced on Vijay is at par with the basin silk. The Department of sericulture, Government of Karnataka has provided the facility of selling raw silk produced on Vijay in Filature "A" section of Silk Exchange owing to its superior quality.

### GUIDELINES FOR USERS

The machines are generally supplied by manufacturer in dismantled condition. The users should find whether the following components are intact and ready for assembly as per the drawing supplied.

1. REEL FRAME: a) For single unit : 1 No. b) For double unit : 2 Nos. (This is in assembled condition which includes one gear, one set of pulleys (fast and loose) and two ball bearings)
2. SMALL REELS FRAME: a) For single unit: 1 No. b) for double unit : 2 Nos. (This is also in assembled condition which includes 1 pulley and 6 small reels with a spring and a pin)
3. HANDLE : 1 No.  
(To be assembled on main driving shaft for driving manually)
4. LEATHER BELT : 1 No.  
(To be assembled on fast and loose pulley of rereel shaft and a pulley on fly wheel shaft)
5. BUTTON: a) For single unit : 6 Nos b) for double unit: 12 Nos.  
(To be assembled in the button holder)
6. ADDITIONAL SMALL REELS: a) For single unit : 6 Nos b) for double unit: 12 Nos
7. ALUMINIUM BASIN: a) for single unit: 1 No. b) for double unit: 2 Nos.
8. This machine has been provided with additional driving system, which includes a chain, a ratchet wheel and a pedal. This system may be utilised for driving the fly wheel by means of pedalling.

## MACHINE DRAWING OF VIJAY



A technician busy in preparing drawing/blue prints of Vijay for supply to various machine manufacturers.

### COMMISSIONING OF 'VIJAY'

1. The erection of the machine should be done on a level ground preferably on cement concrete base.
2. The machine should be assembled as per users' guidelines and isometric drawing in page No.4
3. All nuts and bolts should be perfectly tightened to avoid vibrations.
4. Reeling and rereeling shafts should run smoothly on respective ball bearing housings.
5. The alignment of tarapatti, porcelain button holders, croissure pulleys, thread guides, distributor guide etc. should be perfectly checked.
6. The wooden buttons of all the reels should be made perfectly smooth.
7. For rereeling operation the distance between small reels with raw silk and pigtail guide holder should not be more than 0.7 m. For the above a platform made of wood or brick is to be constructed behind the machine.
8. After completion of erection of the machine, the oven is to be constructed by the entrepreneurs as per the line diagram in page No.14
9. For regular and smooth running of machine the following spare parts should be kept in stock.
  1. Reel shaft with 6 Nos. of small reels ..... 1 set.
  2. Croissure pulleys ..... 2 dozens
  3. Pigtail guides ..... 2 dozens
  4. Porcelain buttons ..... 2 dozens
  5. Leather belt ..... 5 m.
10. Once in a week oiling and greasing is to be done for all moving parts/driving mechanism of the machine.



### **APPROVED MANUFACTURERS OF VIJAY**

1. M/s. KARNATAKA SILK INDUSTRIES CORPORATION LTD.,  
CENTRAL WORKSHOP,  
CHANNAPATNA - 571 501.  
KARNATAKA. (PHONE: 350)
2. M/s. ALTEX INDUSTRIES,  
C - 16. INDUSTRIAL ESTATE,  
RAJAJI NAGAR,  
BANGALORE - 560 010.  
KARNATAKA (PHONE: 350278)
3. M/s. NATIONAL TANK MANUFACTURING WORKS,  
32, CANAL SOUTH ROAD,  
CALCUTTA - 700 015.  
WEST BENGAL. (PHONE - 241568). GRAMS: PARROT.